NISTIR 6890

Fire Resistance Determination and Performance Prediction Research Needs Workshop: Proceedings

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Editor

National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

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Building and Fire Research Laboratory

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U.S. Department of Commerce
Donald L. Evans, Secretary

Technology Administration
Phillip J. Bond, Under Secretary of Commerce for Technology

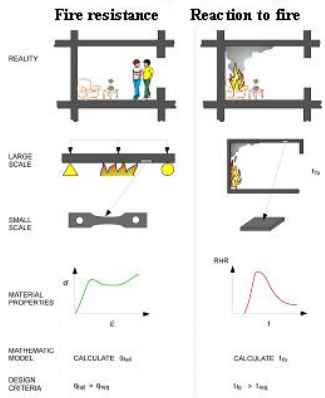
National Institute of Standards and Technology
Arden L. Bement, Jr., Director

I. Improved Fire Testing in Combination with Calculation
Ulf Wickstrom, SP Fire Technology
Borås, SWEDEN

"Improved fire testing in combination with calculations".

- Ulf Wickström
  - SP
- Borås, Sweden

Fire safety design



Analysis of fire exposed structures

- Fire development – design fires
- Heat transfer to fire exposed structures
- Temperature development in structures
- Mechanical behaviour of structures

Proposals for improvements in fire resistance design

- Develop methods for measuring **thermal** properties of structural and protective materials at elevated temperature
- Develop methods for measuring **mechanical** properties of structural materials at elevated temperature
- Improve furnace testing and develop technics for monitoring deformation properties of structural elements

TPS apparatus for measuring thermal properties

TPS = transient plane source, heat transmission, thermal diffusivity

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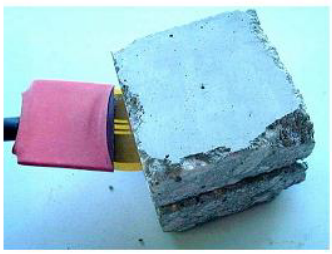


TPS apparatus for measuring thermal properties

TPS = transient plane source, heat transmission, thermal diffusivity

Proposals for improvements in fire furnace testing

- Use **Plate Thermometers** to monitor and control temperature in furnaces
- Measure the deformation properties of structural elements during fire test exposure

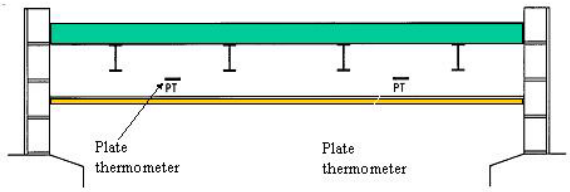
Temperature control of furnaces

ASTM

The Plate Thermometer yields better temperature control of furnaces

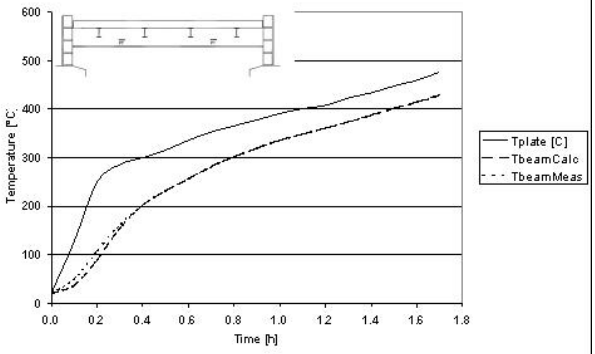
CEN and ISO

Plate thermometer measurments

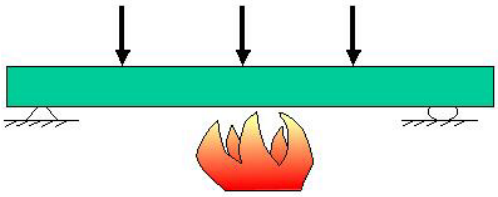


Furnace

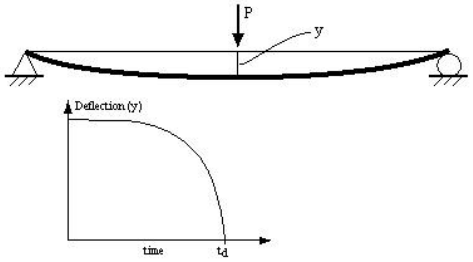
Plate thermometer measurments



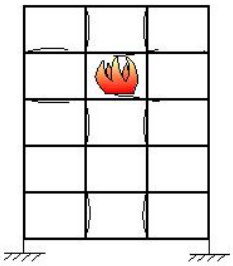
Test model in standard test



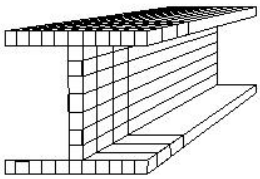
Standard testing of a loadbearing beam yields only the fire endurance time



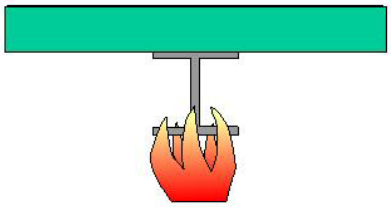
A global analysis requires member deformation properties



Finite element modelling



Composite structure



Get the deformation properties during fire testing